Oct. 16, 1923. 1,470,812

A. F. R. COTTON

GRAMOPHONE

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Fig. 1.

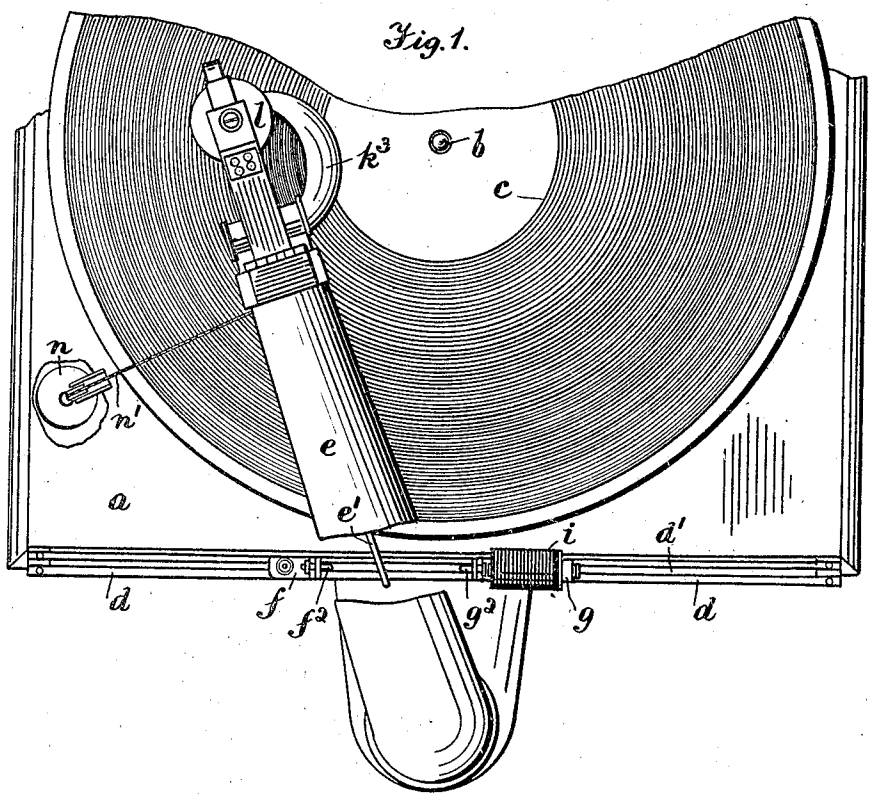
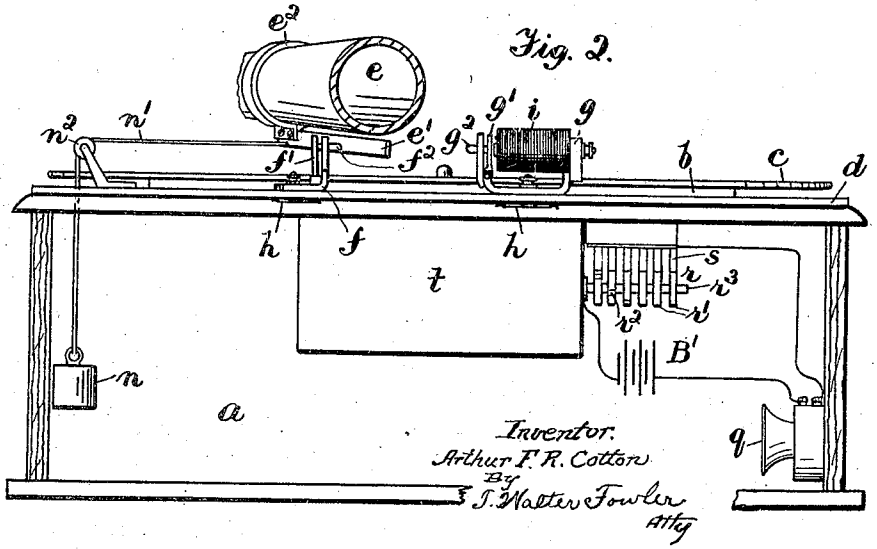



Fig. 2.




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Fig. 3.

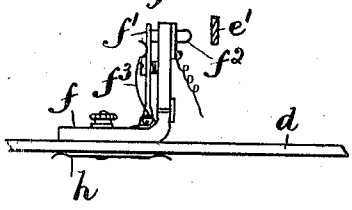



Fig. 4.

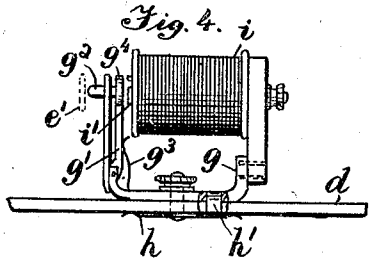



Fig. 5.

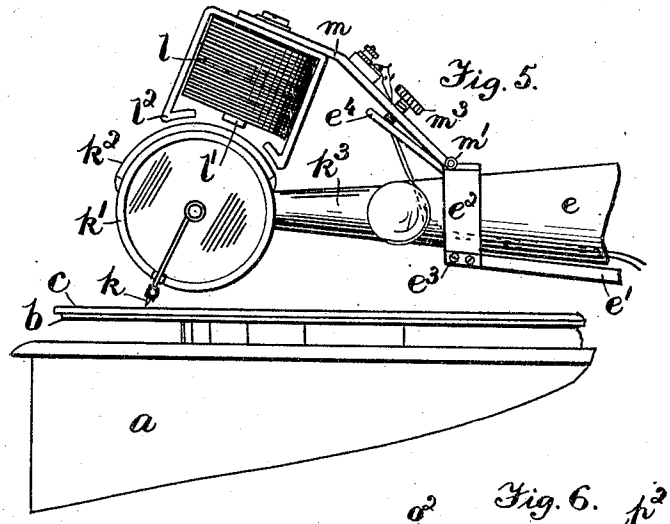



Fig. 6.

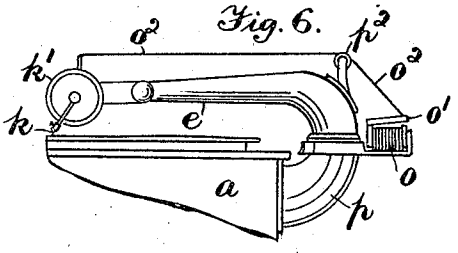



Fig. 7.

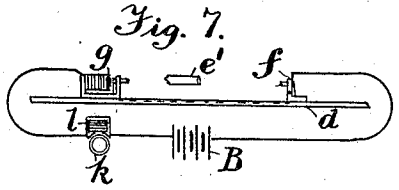
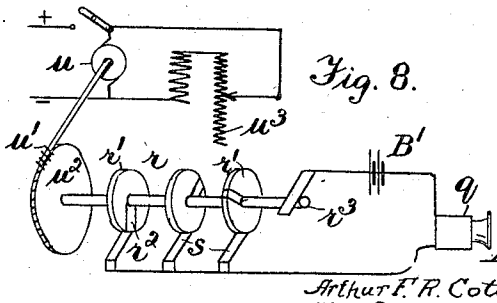



Fig. 8.




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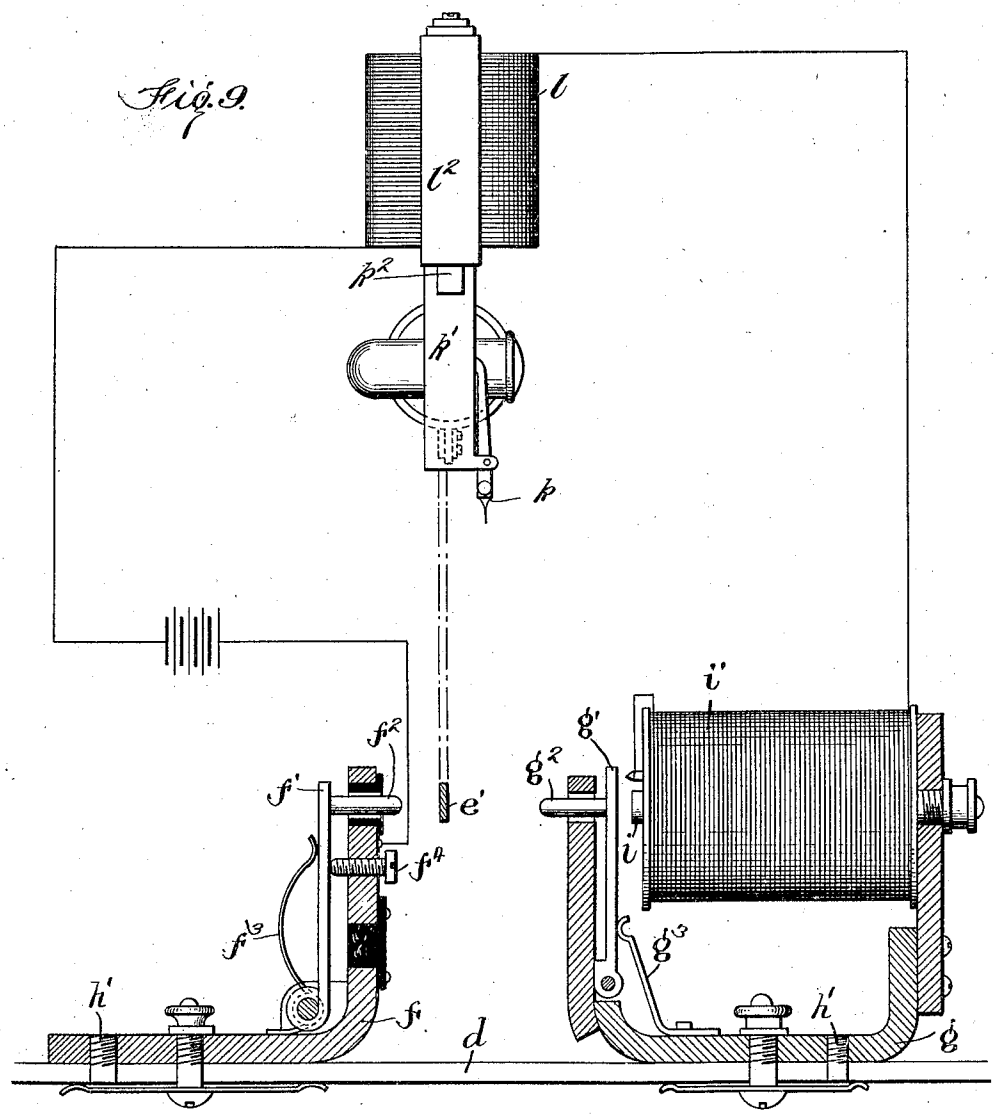
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GRAMOPHONE

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Fig. 9.




Inventor:
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By J. Walter Fowler Jr
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Patented Oct. 16, 1923. 1,470,812

# UNITED STATES PATENT OFFICE.

ARTHUR FREDERICK RICHMOND COTTON, OF LONDON, ENGLAND.

## GRAMOPHONE.

Application filed January 29, 1920. Serial No. 354,901.

*To all whom it may concern:*

Be it known that I, ARTHUR FREDERICK RICHMOND COTTON, a subject of the King of England, residing at London, England, have invented certain new and useful Improvements in Gramophones, of which the following is a specification.

This invention relates to gramophones and the like, and has for object to enable the whole or part of a record to be repeated automatically as often as desired. Further, such repetition can by means of this invention take place without objectionable interruption in the continuity of action. The invention is especially intended to apply to instruments playing dance-music, but may of course be employed for records of any description.

In accordance with this invention, there is provided a mechanical device preferably electrically operated, which at the conclusion of the record, or of the particular part or passage, automatically transfers the reproducing mechanism back to the beginning of the record, or of the part or passage, which is to be repeated. The transfer and the resetting of the reproducing mechanism are controlled by adjustable stops or the like, whereby these operations may be regulated in relation to the position of the passage or record upon the disc or the like.

During the transfer of the reproducer back to the earlier point in the record the needle is raised from contact with the revolving record disc the returning device becoming operative only as a result of such raising of the needle. The needle and its supporting soundbox or the complete tone-arm, may be lifted electrically, by an adjustable stop at the end of the record or of the portion required, and be reset by a further adjustable stop at the commencement of the record or passage, causing the needle to be replaced in operative position on the record.

The invention is hereafter more fully described with reference to the accompanying drawings, in which:—

Figure 1 is a partial plan view of a gramophone provided with the present invention.

Figure 2 is an elevation of the same in part section.

Figure 3 is an enlarged detail of the stop which determines the starting point.

Figure 4 is a similar view of the second stop, which controls the point of repetition.

Figure 5 is a detail of the magnetic device for raising the needle during the return to the starting point.

Figure 6 represents an alternative arrangement for raising the needle.

Figure 7 is a diagram of the electrical connections employed.

Figure 8 represents diagrammatically the use of an electric motor for controlling buzzers.

Fig. 9 is a diagrammatic view of the several elements of the device showing the electrical circuit wiring employed.

Referring to these drawings, there is mounted upon the stationary base or box $a$ supporting the rotary table $b$ carrying the record disc $c$, a horizontal guide bar $d$ which lies substantially at right angles to the general direction of the tone arm $e$, and below the latter, so that as the arm $e$ travels during the playing of the record, it moves from a position above the guide bar and near one end of the same to a similar position above and towards the other end of the bar.

The guide bar carries two upstanding brackets $f$ $g$, which are adjustable in position, being held on the guide bar by suitable means such as leaf-springs $h$, frictionally engaging the bar, and guide-pins $h'$ sliding in a central slot $d'$ to prevent swivelling of the brackets.

The adjustable bracket $f$ is adapted to determine the starting point of the record or passage and is provided with a contact $f'$ whereby an electrical circuit normally closed upon the insulated contact $f^4$ of the bracket $f$ and guide bar $d$ may be opened by a contact-member or striker $e'$ upon the tone-arm $e$ as the latter is moved back towards this end of the guide bar and encounters a pin $f^2$ upon the contact blade $f'$. A spring $f^3$ normally retains the contact $f'$ in the closed position.

The second bracket $g$ carries a pivoted blade $g'$ having a pin $g^2$ against which the striker $e'$ upon the tone-arm engages as it moves forward towards this end of the bar. In so doing, the tone-arm causes the blade $g'$ to close a circuit through the insulated core $i'$ of an electro-magnet $i$ which retains the contact blade $g'$ in the closed position, against the action of a spring $g^3$.

The pivoted blade $g'$ is provided with an

armature $g^4$ facing the core $i'$ of the electro magnet $i$ which is energized by the closing of the circuit. Consequently when the tone-arm reaches the appointed end of its backward travel and the striker meets the contact pin $g^2$, the magnet circuit is closed; the contact blade $g'$ is retained in this position until the contact is opened at $f'$.

In the constructions illustrated in Figures 5 and 6, the needle $k$ is raised during the return of the tone-arm $e$ by means of a magnet $l$ energized in series with the above mentioned circuit, and allowing the needle to descend again upon the disc $c$ as this circuit is broken.

Figure 5 shows the magnet $l$ mounted upon a support $m$ hinged at $m'$ upon a clip $e^2$ adjustably clamped by means of screws $e^3$ upon the tone-arm $e$, the screws $e^3$ serving also for the attachment of the striker $e'$. The magnet $l$ has a central core $l'$ and pole pieces $l^2$ shaped to the contour of an armature $k^2$ of magnetic material secured upon the sound box $k'$. The latter is mounted upon a swan-neck fitting $k^3$ which is pivotally attached to the tone-arm $e$ in the usual manner. A regulating screw $m^3$ passing through the support $m$ and engaging an arm $e^4$ rigidly connected to the clip $e^2$ allows the position of the magnet $m$ to be accurately adjusted in relation to the sound-box.

Energization of the magnet $l$ will therefore attract the armature $k^2$ and raise the sound box $k'$ so as to elevate the needle $k$ from the surface of the record $c$. In this position the tone-arm may be freely moved across the record disc for the purpose of return to the starting point.

Figure 6 shows the magnet $o$ mounted upon a support $p$ attached to the tone-arm bracket $p'$ in proximity to the pivot of this arm $e$, and having a hinged armature $o'$ connected by a wire or cord $o^2$ to the soundbox $k'$. The cord $o^2$ passes over a guide pulley $p^2$ likewise attached to the bracket $p'$, and serves when tensioned by the attraction of the armature $o'$ due to energization of the magnet $o$ to tilt the soundbox and raise the needle from the surface of the record. Instead of employing a cord or wire passing over a pulley, a pivoted bar may be connected at one extremity to the sound box and at the other to the armature of the magnet.

The return movement is effected automatically in the present embodiment of the invention by a weight $n$ located inside the base $a$ and connected by a cord $n'$ passing over a pulley $n^2$ to the clip $e^2$ upon the tone-arm. The weight is gradually raised by the forward travel of the arm $e$ in playing the record, but when the point of repetition is reached and the electrical circuit closed through the connections B, $f$, $f'$, $d$, $g$, $g'$, $i$, $l$, B, (Figures 3, 4 and 7) so as to raise the needle $k$, the weight $n$ pulls back the tone-arm until the contact member $e'$ strikes the pin $f^2$ upon the stop $f$, thereby breaking the circuit and allowing the needle to descend upon the rotating record. Alternatively the return of the tone-arm may be effected by a spring, or other suitable mechanism without departing from the spirit of the present invention. A suitable cushioning device may be fitted to ensure a gentle descent of the needle, or a gentle return of the tone-arm. The magnet may be adjusted to accommodate varying thicknesses of record discs by means of the regulating screw $m^3$.

The interval between the raising of the needle and the re-starting of the record may be reduced by increasing the speed of travel of the tone-arm, but in cases where this interval is a material drawback, as in the case of dance-music, the interval may be filled by the production of suitable sounds, preferably in time with the music of the record. These sounds may be caused by electrical bells or buzzers controlled by the magnet circuit during the return of the tone-arm, or controlled by using the sound-box and magnet $m$ as contacts.

In Figure 2, an electrical buzzer $q$ of the Klaxon type, operated by a battery B', is controlled by a revolving commutator $r$ comprising a number of insulated discs $r'$ having contact segments $r^2$ electrically connected to the spindle $r^3$. Brushes $s$ bearing upon the discs $r'$ make contact successively as the spindle revolves, thereby operating the buzzer. The spindle $r^3$ may be rotated by an electric or other motor, preferably with means for synchronizing its speed in time with the record being reproduced. For this purpose an adjustable rheostat may be employed and connected to the governor of the spring motor $t$ which works the gramophone. By way of example the spindle $r^3$ is shown in Figure 2 as connected to the clockwork of the spring motor $t$ so as to revolve in suitable relation to the record. Figure 8 represents diagrammatically an electric motor $u$ revolving the spindle $r^3$ by means of worm gearing $u'$ $u^2$, and having a variable rheostat $u^3$ in series with its field winding for varying the speed of the spindle $r^3$.

Having thus described my invention, what I claim as such and desire to secure by Letters Patent is:—

1. A gramophone controlling device comprising movable circuit control stops, a contact member upon the tone arm traveling between said stops in accordance with the motion of the reproducer for mechanically actuating the stops, electro-magnetic means for raising the reproducer from the record, switches controlled by said stops and connected in series with the circuit of said elec-

tro-magnetic means, an electro-magnet in said circuit for maintaining one of said switches closed after its mechanical operation and until released by the operation of the other switch, and means for returning the reproducer to an earlier point in the record during the restoring movement of said reproducer.

2. A gramophone controlling device comprising movable circuit control stops, a support for said stops establishing circuit between the same, a contact member upon the tone arm traveling between said stops in accordance with the motion of the reproducer for mechanically actuating the stops, electro-magnetic means for directly attracting and raising the sound box of the reproducer from the record, switches controlled by said stops and connected in series with the circuit of said electro-magnetic means, an electro-magnet in said circuit for maintaining one of said switches closed after its mechanical operation and until released by the operation of the other switch, and means for returning the reproducer to an earlier point in the record.

3. A gramophone controlling device comprising stops, a support for said stops, a mechanical contact member upon the tone arm traveling between said stops in accordance with the motion of the reproducer, electro-magnetic means for raising the reproducer from the record, switches actuated by said stops, one of said switches being normally closed and the other normally opened, and the engagement of said contact member with said stops reversing the position of the respective switches, means for maintaining the normally open switch in closed position after reversal until the opening of said normally closed switch, a single electric circuit connected in series with said raising means, switches and maintaining means, and means for returning the reproducer to an earlier point in the record.

4. A gramophone controlling device comprising adjustable stops, a metallic support for said stops in circuit therewith, a striker arm carried by the tone arm and traveling between said stops, electro-magnetic means for raising the reproducer from the record, mechanically operable switches controlled by said stops and connected in the circuit of said electro-magnetic means and with one another through said support, an electro-magnet in said circuit operating to maintain one of said switches closed until operation of the other switch, and means for returning the reproducer to an earlier point in the record.

5. A gramophone controlling device comprising opposite circuit controlling switches, a striker traveling between said switches in accordance with the motion of the reproducer, an electro-magnet mounted upon the tone arm in position to directly attract the sound box of said reproducer as an armature, a source of current connected in series with said electro-magnet and switches, said switches being operated alternately by engagement of said striker, means for maintaining one of said switches closed until the operation of the other switch, and means for returning the reproducer to an earlier point in the record.

6. A gramophone controlling device comprising opposite circuit controlling stops, a striker traveling between said stops in the motion of the reproducer, electro-magnetic means for raising the reproducer from the record, switches carried by said stops, said switches being connected in series with the circuit of said electro-magnetic means, an electro-magnet having a core disposed to maintain one of said switches in closed position when mechanically actuated by a switch member upon one of said stops, and means for returning the reproducer to an earlier point in the record.

In testimony whereof I have affixed my signature in presence of two witnesses.

ARTHUR FREDERICK RICHMOND COTTON.

Witnesses:
VICTOR F. FEENY,
CYRIL J. FEENY.